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Assessing student Engagement in School: Development and validation of a four-dimensional scale

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Abstract

The problem statement: Student engagement in school has been conceptualized through three dimensions: affective, behavioural, and cognitive. Recent evidence suggests that personal agency could be added as a fourth dimension. The dimensionality of engagement has constituted a problem. **Purpose of the study:** To measure these dimensions of engagement in Portuguese schools, a new 20-items scale was developed, entitled Students' Engagement in School Four-dimensional Scale, SES-4DS. **Research questions:** Does the dimensionality of the students' engagement in school contains four dimensions, not just three? Does the supposed four-dimensional scale present good psychometric qualities, such as internal consistency and external validity? **Research methods:** Its psychometric properties were examined with data from 685 sixth, seventh, ninth, and tenth graders. The analysis allowed to find a scale with 20 items that, with a high percentage of variance explained and good levels of reliability. In the study of external validity, the results in the SES-4DS appeared significantly related to the academic achievement. **Findings:** The results permitted to find this scale presents psychometric qualities and can be used in research and psychoeducational practice, to assess the multidimensional students' engagement in school. The future use of the SES-4DS is considered and proposed. This scale may be a useful opportunity for psychologists and teachers.

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1. Introduction

Student engagement in school (SES) has been defined as a centripetal experience of bonding the student to the school. Specific dimensions of student engagement were described and empirically validated, such as cognitive,

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affective and behavioral (Fredricks, Blumenfeld, & Paris, 2004; Jimerson, Campos, & Greif, 2003). SES has been operationalized so as the extent to which students are committed to school and motivated to learn (Simon-Morton & Chen, 2009; Veiga, Carvalho, Almeida, Taveira, Janeiro, Baía, et al., 2012). Overall, there is an agreement concerning its multidimensional nature, and is often presented as a meta-construct, with two to three dimensions (Fredricks, Blumenfeld, & Paris, 2004; Jimerson, Campos, & Greif, 2003).

The conceptualization of student engagement in school suffers variations across literature (Fredricks & McColskey, 2012; Reeve & Tseng, 2011). Even when investigators have identical conceptualizations, some variability is found in the item content and number of measured dimensions. The *purpose of the study* was to measure these dimensions of engagement in Portuguese schools, a new 20-items scale was developed, entitled Students' Engagement in School Four-dimensional Scale, SES-4DS. This paper describes the development and validation of four-dimensional scale that measures the cognitive, affective, behavioral, and agentic aspects of student engagement in school.

2. Method

2.1. Sample

The sample frame was the Portuguese country. Participants in this study were 685 adolescents, 296 boys (43.2%) and 389 girls (56.8%). Each school year group had the following number of participants and percentage (in parentheses): sixth grade (138, 20.1%), seventh grade (170, 24.8%), ninth grade (197, 28.8%), and tenth grade (180, 26.3%).

2.2. Procedure

Once it was requested the school authorization, it was administrative the questionnaires with anonymous answers and with the supervision of a teacher of classes involved in the study. This task occurred during the regular class hours, having collaborated voluntary students with the necessary time to answer the questionnaires provided.

2.3. Instruments

SES-4DS Student Engagement in School-Four-Dimensional Scale. Participants completed the SES-4DS as a part of a larger research project on the differentiation and promotion of student engagement in schools. Data reported in this paper are based on the administration of the second version of SES-4DS in a sample of Portuguese middle and high-school students. This paper provides information on construct validity, criterion-related validity, and reliability (internal consistency) of SES-4DS.

SES Student Engagement Scale (Lam et al., 2014). Together with SES-4DS, participants also completed the SES. This questionnaire was built and tested to measure, as precisely as possible, the dimensions of school engagement as described in the literature. Based on previous empirical evidence, Lam and her colleagues (2014) defined three dimensions of school engagement (i.e., cognitive, affective, and behavioral), separating them from antecedents and outcomes.

3. Results

3.1. Factor structure of SES-4DS

Table 1 summarizes the data obtained from the exploratory factor analysis that was applied to the working version of SDS-4DS.

Table 1. Exploratory factor analysis of SES-4DS.

Items	Hypothetical factor	Item Loadings				Communalities
		Factor 1	Factor 2	Factor 3	Factor 4	
1. When writing my work, I begin by making a plan for drafting the text	Cognitive	.11	.07	.69	.09	.50
2. I try to connect what I learn in one	Cognitive	.30	.11	.61	.07	.49

discipline with what I learn in others						
3. I spend a lot of my free time looking for more information on topics discussed in class	Cognitive	.15	-.06	.77	-.05	.62
4. When I'm reading, I try to understand the meaning of what the author wants to transmit	Cognitive	.29	.10	.51	.20	.39
5. I review my notes regularly, even if a test is not coming up	Cognitive	.19	.06	.74	.03	.59
6. My school is a place where I feel excluded	Affective	-.01	.62	-.12	.33	.51
7. My school is a place where I make friends easily	Affective	.19	.78	.05	-.08	.66
8. My school is a place where I feel integrated	Affective	.15	.83	.11	-.01	.73
9. My school is a place where it seems to me that others like me	Affective	.11	.77	.23	-.04	.66
10. My school is a place where I feel alone	Affective	-.05	.73	-.03	.24	.60
11. I am absent from school without a valid reason	Behavioral	-.07	.13	.11	.59	.38
12. I am absent from classes while in school	Behavioral	-.01	.05	.07	.72	.53
13. I deliberately disturb classes	Behavioral	-.03	-.01	.05	.78	.61
14. I am rude toward teachers	Behavioral	-.03	.07	-.08	.75	.57
15. I am distracted in the classroom	Behavioral	.01	-.03	.41	.52	.44
16. During classes I put questions to the teachers	Agency	.75	.12	.26	.08	.65
17. I talk to my teachers about my likes and dislikes	Agency	.74	.02	.18	-.07	.58
18. I comment with my teachers, when something interests me	Agency	.80	.07	.21	-.02	.70
19. During lessons, I intervene to express my opinions	Agency	.83	.14	.09	-.04	.73
20. I make suggestions to teachers about how to improve classes	Agency	.69	.02	.17	-.10	.52

Note.— $N = 685$; $KMO = .84$; Bartlett's test: $\chi^2_{150} = 5009.74$, $p < .001$

Values for KMO and Bartlett's tests supported the reduction item reduction. In this respect, the inter- SES-4DS items correlations, as well as value of determinant of the zero-order correlation matrix ($\delta = .06$) showed the absence of multi-collinearity (i.e., high correlations among variables) and singularity (i.e., perfectly correlated variables). An initial factor solution included four factors which, together, explained 57.91% of the variance in item scores. These results suggest that the four dimensions of student engagement in school are relatively independent of one another in terms of their conceptual meanings.

3.2. Confirmatory factor analysis

Using CFA, three factorial models were tested and compared with each other. The one- latent factor model showed a poor statistical fit to the data: $\chi^2 = 2838.09$, $df = 170$, $p < .001$, $SRMR = .14$, $CFI = .45$, $RMSEA = .151$ (C.I. 90%: .147-.156). Furthermore, none of the latent factor loadings was significant. The second model included four first-order latent factors (cognitive, affective, behavioral, and agency) which were allowed to correlate. This model showed an acceptable fit to the data: $\chi^2 = 792.73$, $df = 164$, $p < .001$, $SRMR = .07$, $CFI = .87$, $RMSEA = .075$ (C.I. 90%: .070-.080). In addition, all factor loadings were significant (see Table 2).

Table 2. Confirmatory factor analysis of SES-4DS (four-latent correlated factors).

No. of Item/Observed Variable	Hypothetical Latent Factor	Latent Factor Standardized Loadings		
		Est.	Bootstrap est.	Bias
1. When writing my work, I begin by making a plan for drafting the	Cognitive	.594	.597	.003

text				
2. I try to connect what I learn in one discipline with what I learn in others	Cognitive	.673	.674	.001
3. I spend a lot of my free time looking for more information on topics discussed in class	Cognitive	.644	.646	.002
4. When I'm reading, I try to understand the meaning of what the author wants to transmit	Cognitive	.587	.585	.002
5. I review my notes regularly, even if a test is not coming up	Cognitive	.663	.665	.002
6. My school is a place where I feel excluded	Affective	.478	.479	.001
7. My school is a place where I make friends easily	Affective	.746	.743	.003
8. My school is a place where I feel integrated	Affective	.859	.869	.001
9. My school is a place where it seems to me that others like me	Affective	.765	.768	.003
10. My school is a place where I feel alone	Affective	.583	.584	.001
11. I am absent from school without a valid reason	Behavioral	.520	.519	.001
12. I am absent from classes while in school	Behavioral	.628	.632	.004
13. I deliberately disturb classes	Behavioral	.720	.713	.007
14. I am rude toward teachers	Behavioral	.649	.642	.007
15. I am distracted in the classroom	Behavioral	.492	.488	.004
16. During classes I put questions to the teachers	Agency	.760	.760	.000
17. I talk to my teachers about my likes and dislikes	Agency	.694	.696	.002
18. I comment with my teachers, when something interests me	Agency	.796	.798	.002
19. During lessons, I intervene to express my opinions	Agency	.799	.801	.002
20. I make suggestions to teachers about how to improve classes	Agency	.639	.640	.001

These results suggest that the four-latent inter-correlated factors model, as well as the four-latent first-order inter-correlated factors and a second-order latent factor model would best describe the factor structure of SES-4DS, and that this new instrument allows a multidimensional measurement of student engagement in school.

3.3. Validity of SES-4DS

In order to estimate convergent validity of SES-4DS, zero-order correlations with scores on the SES (Lam et al., 2014) were computed. The correlational data suggest that SES-4DS is a valid instrument for measuring engagement in school. These results strengthened the psychometric evidence for agency as a distinct dimension of student engagement in school.

Criterion-related validity. Table 3 summarizes the data obtained from comparisons between the scores of students with one or more retentions and those of students without retentions. In relation to the possible range of scores on SES-4DS, students from both groups showed the tendency to express a moderate level of cognitive engagement and agency. Furthermore, criterion-related validity of the SES-4DS was supported by its significant relationships with grades in Portuguese and Mathematics (Table 4). The total score on SES-4DS shared 9.0% of common variance with grades in Portuguese, and 8.4% of common variance with grades in Mathematics.

Table 3. Summary statistics for SES-4DS and its subscales by number of retentions.

Subscales	With retentions (N = 120)		Without retentions (N = 565)		t_{683}	d
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Cognitive	17.48	4.89	18.92	4.89	2.92 **	0.29
Affective	23.04	5.13	25.14	4.50	4.16 ***	0.46
Behavioral	24.78	4.77	27.27	2.77	5.51 ***	0.78
Agency	17.58	6.11	18.88	5.67	2.24 *	0.23
Total engagement	82.89	12.20	90.22	11.94	6.08 ***	0.61

Note.—* $p < .05$; ** $p < .01$; *** $p < .001$

Table 4. Correlations with school grades.

Subscales	Portuguese	Mathematics
Cognitive	.23 ***	.21 ***
Affective	.13 **	.14 ***
Behavioral	.21 ***	.22 ***
Agency	.20 ***	.20 ***
Total engagement	.30 ***	.29 ***

Note.—** $p < .01$; *** $p < .001$

Reliability. Based on Cronbach's α estimates obtained for the whole sample, the internal consistency of the subscales corresponding to the four factors was: .76 (cognitive dimension), .82 (affective dimension), .70 (behavioral dimension), and .85 (agency). For total scale, $\alpha = .82$. Thus, the data revealed satisfactory internal consistency for the SES-4DS.

4. Discussion and conclusion

In the last two decades, student engagement in school has been thoroughly investigated in literature (Appleton, Christenson, & Furlong, 2008; Fredricks, Blumenfeld, & Paris, 2004; Reeve & Tseng, 2011). It has been suggested that students who are engaged and successful in their school activity tend to have a solid knowledge in various subjects, to internalize efficient learning strategies, to obtain good academic results, to experience satisfactory interpersonal relationships, as well as a sense of community, to behave in a manner that is valued by peers and teachers (Wentzel, 2003). Therefore, the development of reliable and valid measures of student engagement in school should become a priority for researchers.

Using both EFA and CFA, the present paper offers psychometric evidence for the factor structure of a new short self-report scale designed to capture the dimensions of student engagement in school. Factor analyses revealed a well-differentiated four-factor model. Latent factors were identified as cognitive, affective, behavioral, and agentic engagement. The internal consistencies for all these dimensions were satisfactory. The correlations with scores on subscales of a previously well-validated measure of student engagement (i.e., SES) suggest that SES-4DS is a valid tool for measuring engagement in school. In all four dimensions of engagement, students with retentions scored significantly lower than students without retentions. In addition, significant correlations with grades in Portuguese and Mathematics were considered as evidence of criterion-related (concurrent) validity of SES-4DS.

Further data are also needed to address the question of the factor structure invariance across cultural background, gender and age (or grade level) of students. The order of items inserted by dimension (see appendix) is the proposed order in future studies, and it has been used in subsequent studies with very similar results to those presented here (Moura, Breia, Pereira, Henriques, & Fonseca, 2014).

Compared to other instruments designed to measure student engagement in school, SES-4DS presents two improvements: a) is a short and parsimonious scale for measuring the three widely accepted dimensions of student engagement in school, which have been extensively described in the literature (i.e., cognitive, affective, and behavioral); this feature may be useful for research purposes or intervention requiring the measurement of a large number of variables; b) includes a fourth dimension, namely agency which refers to the student's active interest and self-reliance related to learning and knowledge acquisition.

The results we reported in the present paper suggest that the psychometric qualities of SES-4DS are consistent. Thus, the SES-4DS may provide researchers and practitioners the possibility to gather valuable information for their studies or interventions on student engagement in school.

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Appendix

Student Engagement in School – Four-Dimensional Scale (SES-4DS), English version.

This questionnaire seeks to know the perceptions of students in relation to their learning experiences. Please answer the questions according to your experience, thoughts and feelings. There are no right or wrong answers. Your answers are going to be used only for investigation purpose and your personal information is going to be kept confidential. Please fill in the circle around number that best represents your opinion, according to the following criteria: (1) total disagreement, (2) disagreement, (3) more disagreement than agreement, (4) more agreement than disagreement, (5) agreement, (6) total agreement.

- ①②③④⑤⑥ 01 (01). When writing my work, I begin by making a plan for drafting the text.
 ①②③④⑤⑥ 02 (06). My school is a place where I feel excluded. (R)
 ①②③④⑤⑥ 03 (11). I am absent from school without a valid reason. (R)
 ①②③④⑤⑥ 04 (16). During classes, I put questions to the teachers.
 ①②③④⑤⑥ 05 (02). I try to connect what I learn in one discipline with what I learn in others.
 ①②③④⑤⑥ 06 (07). My school is a place where I make friends easily.
 ①②③④⑤⑥ 07 (12). I am absent from classes while in school. (R)
 ①②③④⑤⑥ 08 (17). I talk to my teachers about my likes and dislikes.
 ①②③④⑤⑥ 09 (03). I spend a lot of my free time looking for more information on topics discussed in class.
 ①②③④⑤⑥ 10 (08). My school is a place where I feel integrated.
 ①②③④⑤⑥ 11 (13). I deliberately disturb classes. (R)
 ①②③④⑤⑥ 12 (18). I comment with my teachers, when something interests me.
 ①②③④⑤⑥ 13 (04). When I'm reading, I try to understand the meaning of what the author wants to transmit.
 ①②③④⑤⑥ 14 (09). My school is a place where it seems to me that others like me.
 ①②③④⑤⑥ 15 (14). I am rude toward teachers. (R)
 ①②③④⑤⑥ 16 (19). During lessons, I intervene to express my opinions.
 ①②③④⑤⑥ 17 (05). I review my notes regularly, even if a test is not coming up.
 ①②③④⑤⑥ 18 (10). My school is a place where I feel alone. (R)
 ①②③④⑤⑥ 19 (15). I am distracted in the classroom. (R)
 ①②③④⑤⑥ 20 (20). I make suggestions to teachers about how to improve classes.

Note. (R) Indicates reverse-coded items. *The order of items* without parentheses - items inserted by dimension - is the proposed. *Dimensions and their items* in order with items inserted by dimensions: cognitive (1, 5, 9, 13, 17), affective (2, 6, 10, 14, 18), behavioral (3, 7, 11, 15, 19), agency (4, 8, 12, 16, 20).

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